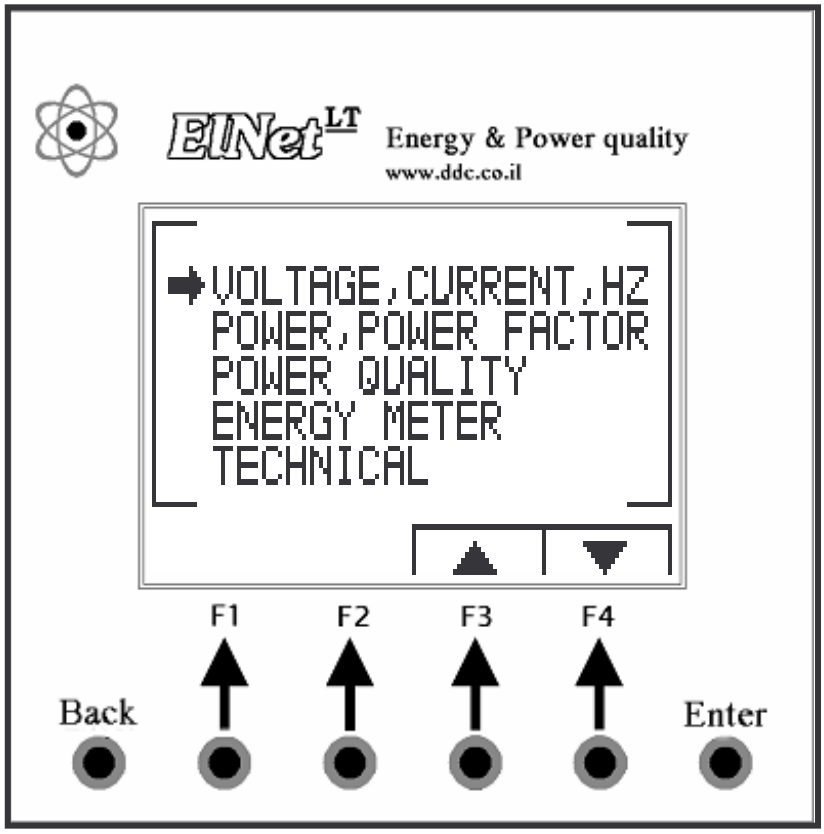

Elnet LT

Electrical Measurements & Power Quality

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CHAPTER 1 — INTRODUCTION

1.1 — About the *ElNet LT* Multimeter

Large consumers of electricity e.g. factories, hotels, hospitals, municipalities, need to know the history of their consumption and the quality and the values of the power supply. Details such as Voltage, Current, Power Factor, Hertz, Neutral Current, Energy consumption can be displayed by the ***ElNet LT*** Energy & Power Multimeter.

An additional feature of the Multimeter is the ability to measure Harmonics. Part of the Electricity Supply Authority's bill reflects poor or good Harmonics in the consumer's system, therefore it is in his interest to monitor Harmonics and try to improve it.

The ***ElNet LT*** Energy & Power Multimeter is a compact, multi functional, three-phase Multimeter simple to install and is especially designed to integrate into Building Management Systems. It requires no special mounting and is ideally suited for mounting on the front face of any standard electrical panel.

The Configuration and Setup is menu driven, with password protection.

Communication with external devices is simple and is based on standard known protocol.

Each ***ElNet LT*** Energy & Power Multimeter is carefully and meticulously manufactured using quality components and the latest production methods. Before leaving the factory each ***ElNet LT*** Energy & Power Multimeter is calibrated and is sent to the customer accompanied by the test certificate and Certificate of Compliance (C.O.C).

1.2 — How to use this manual

We at CONTROL APPLICATIONS Ltd, envisage this manual to be used by three types of people, i.e. the ***Installation Technician***, the ***Senior Electrical Engineer*** and the end ***User***. For this reason this manual is divided into chapters for ease of reference by each of these different people. There could be a situation where two of the above mentioned tasks can be combined, or in a rare instance one person could handle all three tasks.

CHAPTER 1, *Introduction*, describes the ***ElNet LT*** Energy & Power Multimeter, its potential users, the readings it can provide and some of its features in brief.

CHAPTER 2, *Installation,* provides detailed instructions for unpacking, mechanical mounting, and electrical wiring up instructions for the ***Installation Technician.***

CHAPTER 3, *Using the* ***ElNet LT*** Energy & Power Multimeter, describes in detail front Panel, the functions of the control buttons, and the Lock Utility.

CHAPTER 4, *Parameter Configuration & Settings* explains in detail the minimum parameters settings needed by the ***Senior Electrical Engineer*** to set up and configure the ***ElNet LT*** Energy & Power Multimeter.

CHAPTER 5, *Front Panel Displays,* is an easy to follow step-by-step guide to obtain readings, graphs and tables.

CHAPTER 6, *Communications* provides details about the Communication capabilities of the ***ElNet LT*** Energy & Power Multimeter, and how to Set Up.

CHAPTER 7, *Specifications,* is a detailed list of specifications of the ***ElNet LT*** Energy & Power Multimeter.

APPENDIX A, *Installation & Configuration Check List*, provides a Check List to insure no important steps will be missed during the initial set up.

1.3 — Safety Information

The purpose of this manual is to help you. Please read the instructions carefully before performing any installation and note any precautions.

WARNING!

- Ensure that all incoming AC power and other power sources are turned off before performing any work on the ***ElNet LT*** Energy & Power Multimeter. Failure to do so may result in serious or even fatal injury and/or equipment damage.
- If the ***ElNet LT*** Energy & Power Multimeter is damaged in any way do NOT connect it to any power source.
- To prevent a potential fire or shock hazard, never expose the ***ElNet LT*** Energy & Power Multimeter to rain or moisture.
- Keep the surrounding area free of dirt and clutter especially metal objects. Good housekeeping pays.
- Inspect the cables periodically for cracks, kinks or any other signs of wear.
- Keep children away.
- Do not pull the cords.

- Users should stay alert and not approach the rear of the ***ElNet LT*** Energy & Power Multimeter while tired or under the influence of alcohol, medicines or any other chemical substance that would tend to make a person drowsy.
- Above all use common sense at all times.

1.4 — Warranty

CONTROL APPLICATIONS Ltd provides a 12- Month warranty against faulty workmanship or components from date of dispatch under the condition that the product was properly installed and used.

CONTROL APPLICATIONS Ltd does not accept liability for any damage that may be caused by natural disasters (such as floods, fire, earthquake, lightening etc.).

CONTROL APPLICATIONS Ltd does not accept liability for any damage that may be caused by malfunction of the ***ElNet LT*** Energy & Power Multimeter.

CONTROL APPLICATIONS Ltd will advise the customer on the proper installation and use of the ***ElNet LT*** Energy & Power Multimeter, but will not accept any responsibility that the instrument is suitable for the application for which it was originally purchased.

This warranty may become void if the Installation, Parameter Configuration & Setting Instructions are not carried out according to the instructions set out by CONTROL APPLICATIONS Ltd.

The ***ElNet LT*** Energy & Power Multimeter has no user serviceable parts and should be opened and serviced by a duly qualified authorized representative only. The sensitive electronics could become damaged if exposed to a static environment. This action would void the warranty.

This warranty is limited to the repair and/or replacement at CONTROL APPLICATION Ltd sole discretion of the defective product during the warranty period. Repaired or replaced products are warranted for ninety (90) days from the date of repair or replacement, or for the remainder of the original product's warranty period, whichever is longer.

CONTROL APPLICATIONS Ltd is always at your service to advise the customer on any problem that may be encountered regarding any installation, operation, parameter & configuration settings or maintenance.

1.5 — Your comments are welcome

CONTROL APPLICATIONS Ltd. sincerely thanks you for choosing our ***ElNet LT*** Energy & Power Multimeter. We are confident that it will provide you with many years of trouble free service and give you all the power and energy information and history that you expected from the instrument when you bought it.

While every effort was made to keep the information as reliable, helpful, accurate and up to date as possible, all possible contingencies cannot be covered. Technical or typographical errors could occur, and we would be happy to receive any comments, criticisms or notifications of any such errors from you, our valued customer.

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1.6 — Disclaimer

Information in this User Manual is subject to change without notice and does not represent a commitment on the part of CONTROL APPLICATIONS Ltd.

CONTROL APPLICATIONS Ltd supplies this User Manual as is without warranty of any kind; either expressed or implied, and reserves the right to make improvements and/or changes in the manual or the product at any time.

While it is the intention of CONTROL APPLICATIONS Ltd to supply the customer with accurate and reliable information in this User Manual, CONTROL APPLICATIONS Ltd assumes no responsibility for its use, or for any infringement of rights of the fourth parties which may result from its use.

This User Manual could contain technical or typographical errors and changes are periodically made to the information herein; these changes may be incorporated in new editions of the publication.

CHAPTER 2 — INSTALLATION

In this Chapter you will find the information and instructions that the ***Installation Technician*** needs to mount and connect the ***ElNet LT*** *Energy & Power Multimeter*

WARNING!

- During operation, hazardous voltages are present in connecting cables and terminal blocks.
- Fully qualified personnel must do all work. Failure to follow this rule may result in serious or even fatal injury to personnel and/or damage to equipment.
- Refer to Section 1.3 Safety information before carrying out any installation.
- Read this manual thoroughly and make sure you understand the contents before connecting the ***ElNet LT*** *Energy & Power Multimeter* to any power source.

2.1 — Contents of packaging

To unpack the *ElNet LT* Energy & Power Multimeter

The ***ElNet LT*** Energy & Power Multimeter is packed and shipped in a carton approximately 24.5 cm long X 19 cm wide X 12 and cm high.

Before opening the package, ensure the area, clean and dry.

Without using any sharp instruments, carefully open the carton of the ***ElNet LT*** Energy & Power Multimeter.

Please check the contents of the carton, it should contain:

1. New ***ElNet LT*** Energy & Power Multimeter.
2. ***ElNet LT*** User Manual (This book).
3. Test Certificate and Certificate of Compliance (C.O.C).
4. 2 X two pole connector plugs.

2.2 — Mechanical mounting

To Mount the *ElNet LT* Energy & Power Multimeter

NOTE!

Do not mount the ***ElNet LT*** Energy & Power Multimeter too close to any main electrical conductors

Allow sufficient space to carry out maintenance to the back of the ***ElNet LT*** Energy & Power Multimeter

1. Choose a suitable location, and prepare a rectangular hole according to the dimensions shown in Figure 2.1

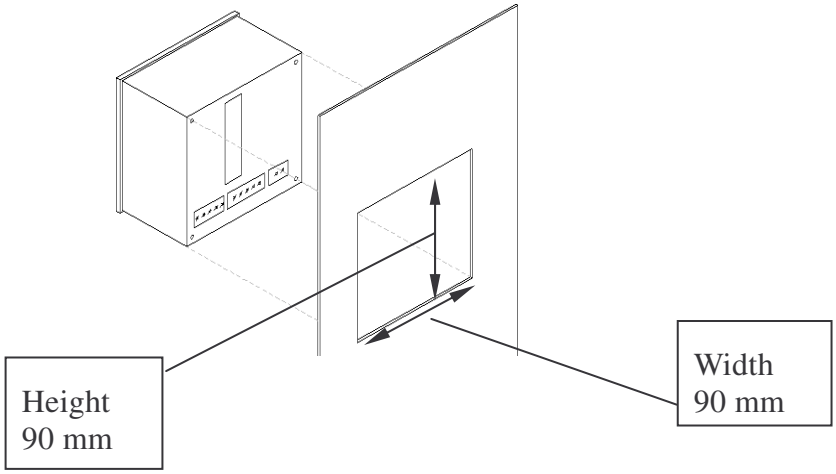

Figure 2.1 **Panel Cutout**

2. Slide the ***ElNet LT*** Energy & Power Multimeter into the pre-prepared rectangular hole (ensure it is the right way up), then push the four mounting clips into position. Use mild force to ensure the clips are securely positioned on the outer case of the ***ElNet LT*** Energy & Power Multimeter.
3. Ensure the ***ElNet LT*** Energy & Power Multimeter is firmly in place.

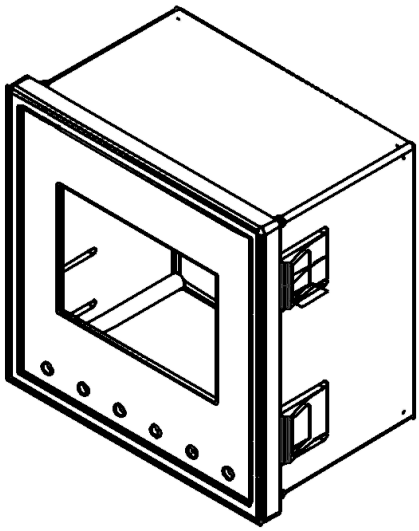

Figure 2.2 **Mounting Clips**

2.3 — Wiring Schematics

To wire up the *ElNet LT* Energy & Power Multimeter

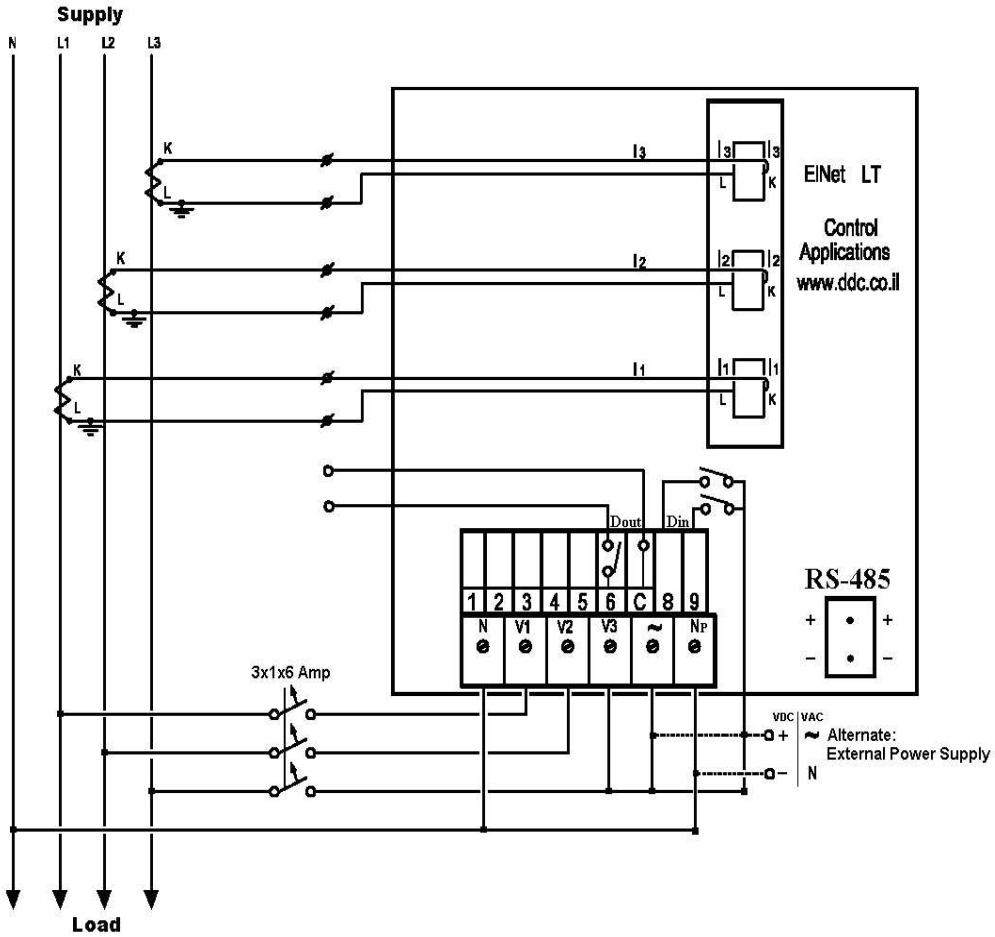

Figure 2.3 **Schematic Wiring Diagram**

2.4 — Rear Panel Connections

Please re-read section 1.3 for safety instructions.

To connect the Rear Panel

All Connections, except those to the CT core of the ***ElNet LT*** Energy & Power Multimeter are made via terminal connector plugs (Voltage input, Power Supply, Communication etc.).
Max. recommended tightening torque for the connector screws is 0.5 Nm.
The CT cores of the ***ElNet LT*** Energy & Power Multimeter are located externally on the rear of the instrument and the lead from the leg of the external Current Transformer must pass through in the correct direction.

NOTE!

Ensure all the connections to the leads of the current transformer wiring are secure and there is no mechanical strain on the wire. The cross section of the leads to the current transformer must be compatible to the power of the current transformer. We recommend a power transformer with at least 3VA and the length of the wiring of the transformer no longer than 3m.

Insert the leads from side "**L**" of the external Current Transformers to the ELNET current transformers the side "L". And from side "K" of the ELNET current transformers back to side "K" of the external transformers.

WARNING!

Never allow an open circuit between the two Current Transformer leads.

Repeat the procedure for **Line 2** and **Line 3.**

Connect the rest of the connections to the ***ElNet LT*** Energy & Power Multimeter by means of terminal connector plugs.
The Rear Panel (See Figure 2.3) has all connections printed and is simple to follow. (See table 2-1 for connections)

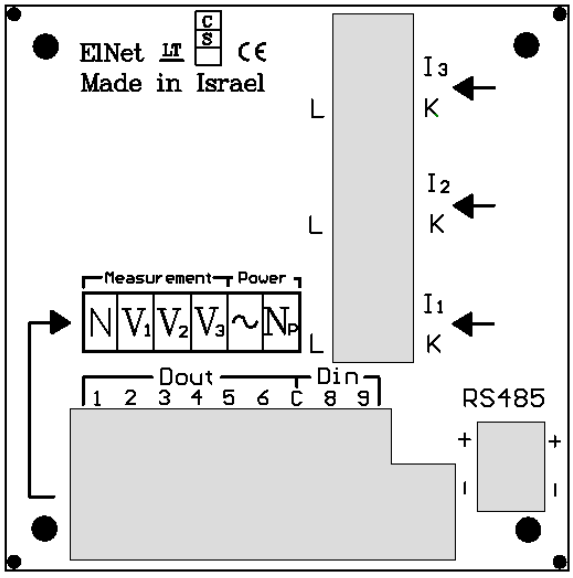

Figure 2.4 **Rear Panel**

Pin Designation	Description	Remarks
V_1	**Line1** Supplied Voltage	Through a 6Amp fuse
V_2	**Line2** Supplied Voltage	Through a 6Amp fuse
V_3	**Line3** Supplied Voltage	Through a 6Amp fuse
N	Neutral	Measurement neutral Line
I_{1A}	From Current Transformer on **Line1**	Note the correct direction to insert the lead
I_{2A}	From Current Transformer on **Line2**	Note the correct direction to insert the lead
I_{3A}	From Current Transformer on **Line3**	Note the correct direction to insert the lead
~	Power Supply 110 - 260 VAC	Or 110-260 VDC, external power supply or bridged from phase measurement
Np	Neutral	Neutral of external power supply
RS485 -	RS485 Comm. (-) Line	
RS485 +	RS485 Comm. (+) Line	

Table 2.1 **Rear Panel connections**

2.5 — Manufacturing Data.

Press F1 on the keyboard for 6 seconds. The following screen will appear.

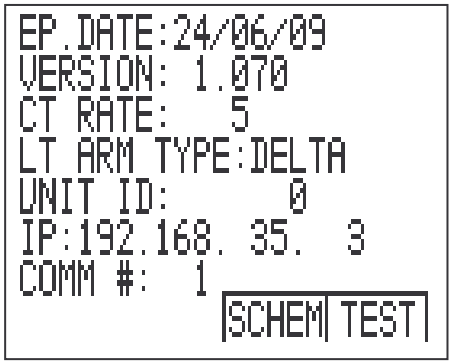

Figure 2.5 **Manufacturing data**

Number	Screen	Description
1	Ep. Date	Production date of software operating system
2	Version	Bios Revision
3	CT Rate	Current transformer ratio
4	Type	Hardware type and electrical network connection
5	Unit ID	Unique identifying number
6	IP Address	IP Address (option)
6	Comm #	Communication address of RS485 MODBUS

Table 2.2 **Production Data**

CHAPTER 3 — USING *ElNet LT* MULTIMETER

In this chapter you will find descriptions and functions of the front panel and the control buttons and how to use them.

3.1 — Front Panel

To operate the front panel

The Front Panel has a graphic screen and 6 operating buttons.

All the readings are shown on a state of the art 128 X 64 resolution graphic screen and are explained in detail in Chapter 5.

The Control Buttons and their functions are fully explained in Section 3.2.

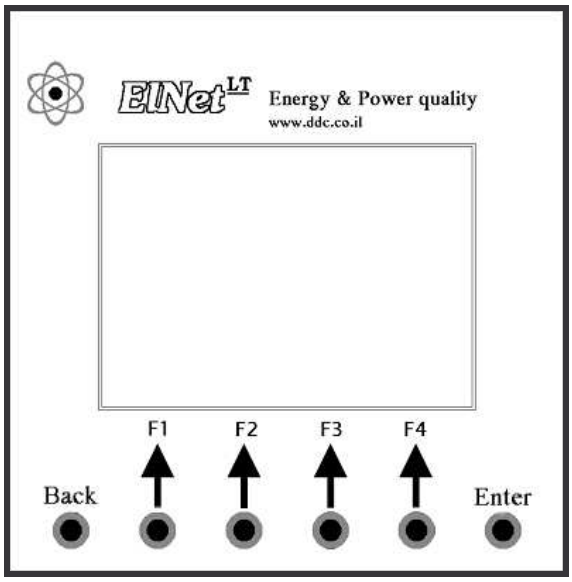

Figure 3.1 **Front Panel**

3.2 — Control Buttons

To operate the Control Buttons on Front Panel

The ***ElNet LT*** Energy & Power Multimeter has six Control Buttons. With these buttons the ***User*** and ***Senior Electrical Engineer*** can achieve all the functions necessary.

The Control Buttons are arranged on a keypad below the display screen and require slight finger pressure to click.

Button "ENTER" accepts the choice and executes the commands.

Button "F1", "F2", "F3", "F4" performs the function that the arrow above is pointing to (e.g. move the curser), or selects the prompt that the arrow is pointing to.

Button **BACK** returns to the previous step or to the Main Menu.

3.3 — Lock Utility

To lock and unlock the Control Buttons

The Control Buttons can be locked against any unauthorized or accidental usage.

NOTE!

Only sub menus can be locked. The Lock Utility does not work on the Main Menu

To lock press "ENTER" for six (6) seconds.

A "Keyboard Locked!" message appears on the screen when any button is pressed.

To unlock simply press "ENTER" for six (6) seconds.

A "Keyboard Unlocked!" message appears on the screen and normal functions can resume.

In the event of a general power failure, the ***ElNet LT*** Energy & Power Multimeter will return to the screen that was showing before the power failure occurred.

CHAPTER 4 — NECESSARY *ElNet LT* SETTINGS

In this chapter you will find instructions to set the minimum settings that are necessary to allow the ***ElNet LT*** Energy & Power Multimeter to function properly.

WARNING!

- The selection, installation and settings of the Current Transformer are the most vital and fundamental actions required to ensure the accuracy of the ***ElNet LT*** Energy & Power Multimeter.
- It is essential to know the ratio of the Current Transformer being installed into the system in order to set the parameter for the Current Transformer correctly.
- All three main current Lines MUST have Current Transformers of the same ratio installed onto them.

4.0 — Entering code

NOTE!

The most important setting necessary for the proper functioning of the ***ElNet LT*** Energy & Power Multimeter is the Current Transformer setting.

The cross section of the leads to the current Transformer must be compatible to the power of the current transformer. We recommend a power transformer with at least 3VA and the length of the wiring of the transformer no longer than 3m.

1 From Main Menu scroll to **Technical Menu.**

2 Click “ENTER”.

The **Enter Code** screen appears

Figure 4.1 **Enter Password**

The password is 1.

Use the buttons F3 & F4 to move the cursor, to set the value use buttons F1 &F2.

3 Click “ENTER”.

NOTE!

If the incorrect password is inserted into the Password field, an Error message appears and the password should be reentered

The **Technical Menu** screen appears

Figure 4.2 **Technical Menu**

Use the buttons F3 & F4 to move the cursor, selecting "NEXT" will lead you to more functions that can be set by the technician.

4.1 — Settings for Current/Voltage Transformer

To set or change settings for Current/Voltage Transformer

See Section 4.0 for instructions to arrive at the **Technical Menu**

1 Scroll to **Transformers ratio** and select current or voltage transformer ratio to be set.
2 Click “ENTER”.

The **Current / Voltage Transformer** screen appears

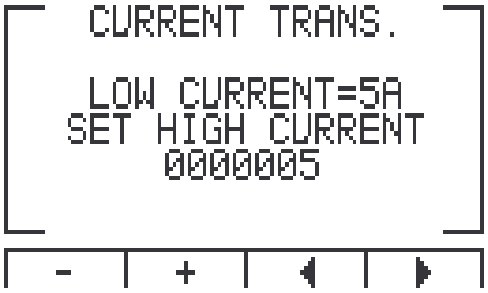

Figure 4.3 **Current Transformer**

The present setting for the **Current Transformer** is shown**.** Use the buttons F3 & F4 to move the cursor, to set the ratio use buttons F1 &F2.

The method for setting for the **Voltage Transformer** is the same.

4.2 — Electrical Connection Check

NOTE!

To avoid any problems arising from incorrect Voltage Connections or accidental reversal of Current Transformer Connections, it is necessary to perform a Phase Order Check before continuing.

To perform Electrical connection Check

See Section 4.0 for instructions to arrive at the **Technical Menu**

1 From Technical Menu scroll to **Connection test**.

2 Click "ENTER".

The **Connections Test** screen appears

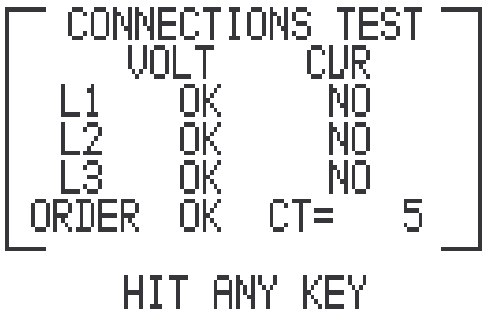

Figure 4.4 **Connections Test**

Very important – very common problem!!!!!

The information above and under is accurate **only** if there is a phase coloration between the current and voltage.

The current (I1,I2,I3) and the voltage (V1, V2, V3) should be connected in this order.

Message	Voltage	Current
OK	Voltage "OK" present on Lines. If "OK" is not present on 3 Lines, then it is not connected correctly	Current present in Lines and synchronized with Voltage Lines. If "OK" is not present on 3 Lines, then it is not connected correctly
OPP	Not Applicable	Wired in incorrect direction
NO	No Voltage	No current

Table 4.1 **Voltage and Current Messages**

Phase Order Messages

Message	Voltage
OK	Correct Phase Order of Voltage Connections
OPP	Incorrect Phase Order i.e. Line 2 does not follow Line 1 and/or Line 1 does not follow Line3

Table 4.2 **Phase Order Messages**

4.3 — Change language

To change language on the display screen

See Section 4.0 for instructions to arrive at the **Technical Menu**
From Technical Menu scroll to **"NEXT"** and again **"NEXT"** and "**LANGUAGE**".
1 Click “ENTER”.

The **Set Language** screen appears

Figure 4.5 **Set Language**

4.4 — Time Settings

To set Time

See Section 4.0 for instructions to arrive at the **Technical Menu**
From Technical Menu scroll to **Set clock**.
1 Click “ENTER”.

The **Set Clock** screen appears

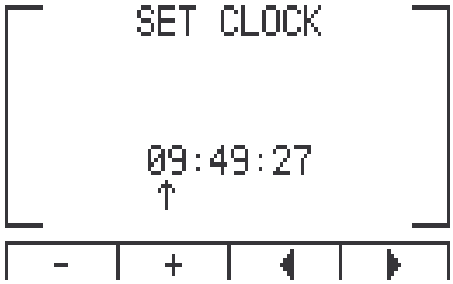

Figure 4.6 **Set Clock**

Use the buttons F3 & F4 to move the cursor, to set the value
use buttons F1 & F2.

4.5 — Date Settings

To set Date

See Section 4.0 for instructions to arrive at the **Technical Menu**.

From Technical Menu scroll to **Set Date**

1 Click "ENTER"
The **Set Date** screen appears

Figure 4.7 **Set Date**

Use the buttons F3 & F4 to move the cursor, to set the value
use buttons F1 & F2.

The Date Format is DD/MM/YY
Day/Month/Year

4.6 — Zero Accumulating Values

To set all accumulating values to Zero
Beware!!!! – Very danger step

1 Repeat step 1 and 2 from Section 4.1.

2 Move the cursor with the F1, F2, F3, & F4 buttons (See Section 3.2 for description of button functions).

3 Insert **6425** into the password field.

4.7 — Setting energy pulse

The digital output (number 6) can be define as a pulse output, each pulse equivalent to pre define energy consumption value , in order to set the pulse out put - See Section 4.0 for instructions to arrive at the **Technical Menu**.

From Technical Menu:

1 Scroll to **NEXT**
2 Scroll to **SET ENERGY PULSE**
3 Click “ENTER”

The **SET ENERGY PULSE** screen appears

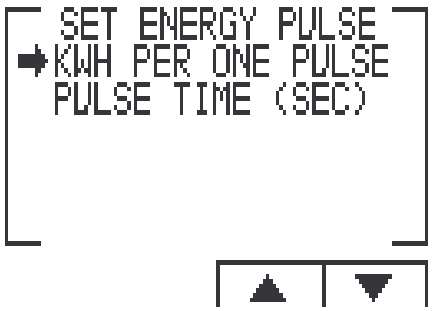

Figure 4.8 **Set Energy Pulse**

4 Set all the values for the pulse output.

5 Please note that while you are using the output for energy pulse usage you can not use the same output for alarms.

4.8 — Delta/star Electrical network definition

The ***ElNet LT*** can be installed in two types of electrical networks: DELTA – a system without neutral line.

STAR – a system with neutral line.

In order to change the type of the electrical network connected to the Elnet LT See Section 4.0 for instructions to arrive at the **Technical Menu**

1 From Technical Menu scroll to **"Next"** then to "DELTA/STAR SYSTEM".

2 Click “ENTER”.

The **Connection** screen appears

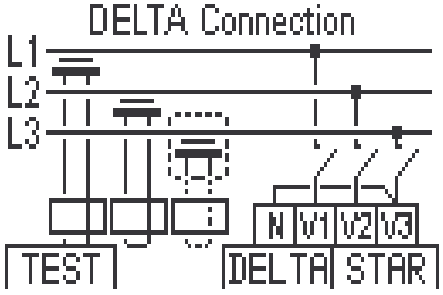

Figure 4.8 **Delta Connection**

3 Use “F3”/ "F4" in order to change the connection type.

When you are using "DELTA" networks the currents (line currents) and the voltages (between phases) are not in the same phase therefore part of the measurements are not applicable and part of the display screens are not applicable.

CHAPTER 5 — FRONT PANEL DISPLAYS

In this chapter you will find instructions on how to obtain the readings that the ***ElNet LT*** Energy & Power Multimeter provides, e.g., Current, Voltage Power, Power Factor, Energy, and Power quality.

5.1 — Current Voltage & Frequency

To display Current Voltage and Frequency for all 3 Phases

1 From Main Menu scroll to Voltage, Current, Hz.

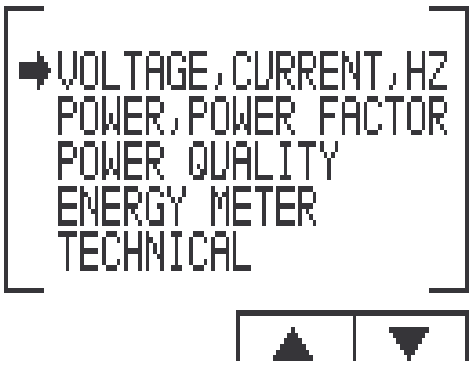

Figure 5.1 **Main Menu**

2 Click “ENTER”.

The **Current Voltage and Frequency** screen appears

Figure 5.2 **Voltage, Current, Hz**

3 Scroll to REAL TIME DISPLAY and click “ENTER”

The **Current Voltage and Frequency** screen appears

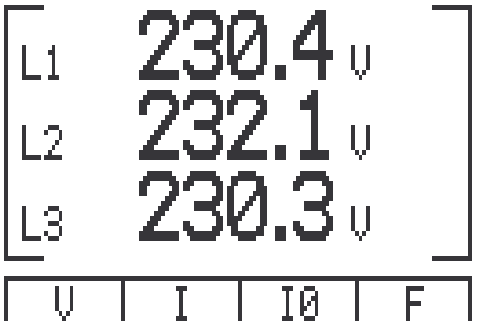

Figure 5.3 **Voltage screen**

4 Use “F1” in order to display voltage values.
5 Use “F2” in order to display current values.
6 Use “F3” in order to display Current in Neutral Line.
7 Use “F4” in order to display Frequency values.

5.2 — Current, Voltage & Frequency Peak Values

To display Current Voltage and Frequency Peak values

1 From Main Menu scroll to **Voltage, Current, Hz .**

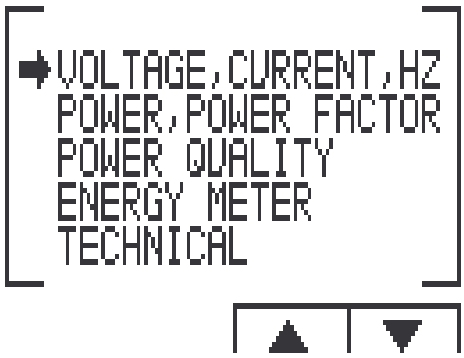

Figure 5.4 **Main Menu**

2 Click “ENTER”.
The **Current Voltage and Frequency** screen appears

Figure 5.5 **Voltage, Current, Hz**

3 Scroll to MIN/MAX display and click “ENTER”.

The **Min / Max** screen appears

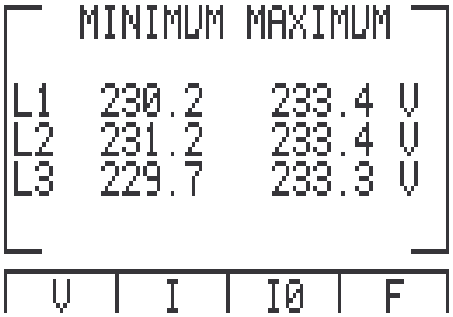

Figure 5.6 **Min / Max values**

4 Use “F1” in order to display voltage peak values.
5 Use “F2” in order to display current peak values.
6 Use “F3” in order to display peak Current in Neutral Line.
7 Use “F4” in order to display Frequency peak values.

5.3 — Reset I , V , F Peak values

In order to clear old peak values

1 From Main Menu scroll to Voltage, Current, Hz.

The **Voltage, Current, Hz** screen appears

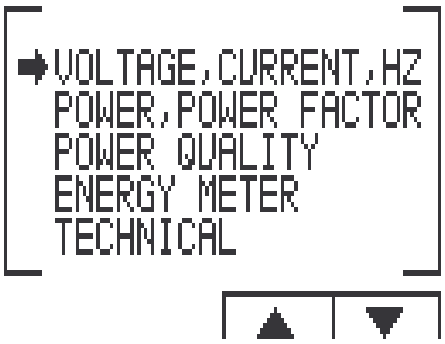

Figure 5.7 **Main Menu**

2 Click “ENTER”.

The **Current Voltage and Frequency** screen appears

Figure 5.8 **Voltage, Current, Hz**

3 Scroll to MIN/MAX RESET and click “ENTER”.

The **Enter Code** screen appears

Figure 5.9. **Enter reset code**

In order to clear old peak values enter password 6474.

Use the buttons F3 & F4 to move the cursor, to set the value use buttons F1 &F2.

5.4 — Power Display

5.4.1 — Real time power display

To display Power for all 3 phases

1 From Main Menu scroll to **Power, power factor** Display.

2 Click “ENTER”.

The **Power, Power factor** screen appears

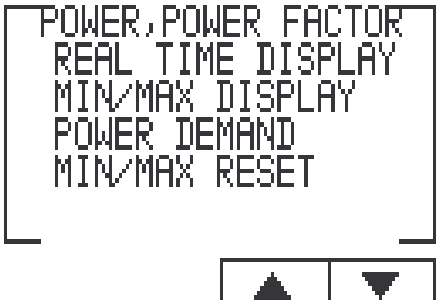

Figure 5.10 **Power, Power factor**

3 Scroll to **REAL TIME DISPLAY** and click “ENTER”.

The real time **Power, Power factor** screen appears

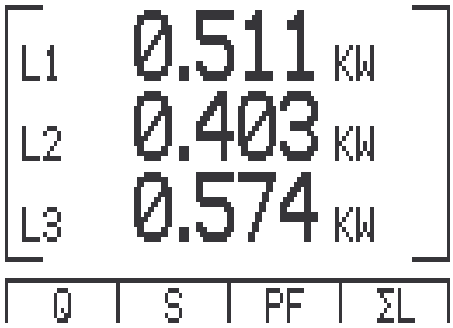

Figure 5.11 **Power factor**

4 Use “F1” in order to display Reactive Power values.
5 Use “F2” in order to display Apparent Power values.
6 Use “F3” in order to display Power Factor values.
7 Use “F4” in order to display total 3 lines active reactive and apparent power values.

Parameter	Description	Unit
P	Active Power for each Line	Watts
Q	Reactive Power for each Line	VAR
S	Apparent Power for each Line	VA
Σ P	Total Active Power for all 3 Lines	Watts
Σ Q	Total Reactive Power for all 3 Lines	VAR
Σ S	Total Apparent Power for all 3 Lines	VA
PF	Power Factor	

Table 5.1 **Power Readings**

5.4.2 — Set / Reset power peak values

To display /reset power peak value

1 From Main Menu scroll to **Power, power factor** Display.

2 Click "ENTER".

The **Power, Power factor** screen appears

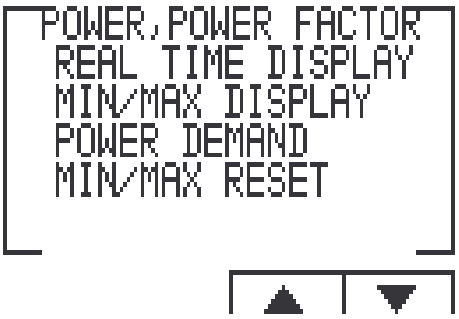

Figure 5.12 **Power, Power factor**

3 Scroll to **MIN/MAX DISPLAY** and click "ENTER" in order to display power peak value and power factor peak values.

The **Min \ Max** screen appears

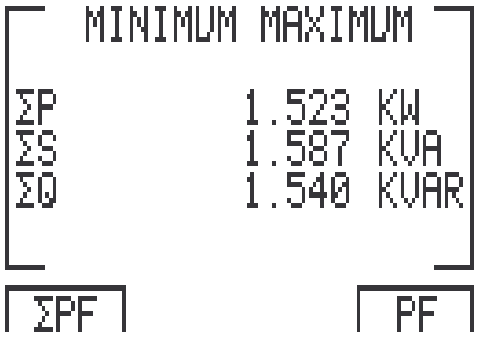

Figure 5.13 **Min \ Max**

4 Scroll to **MIN/MAX RESET** and click "ENTER" in order to clear power peak value and power factor peak values.

The **Enter Code** screen appears

Figure 5.14 **Enter Code**

5 In order to clear old peak values enter password 6474.
6 Use the buttons F3 & F4 to move the cursor, to set the value use buttons F1 &F2.

5.4.3 — Power Demand

To display Power demand within two dates

1 From Main Menu scroll to **Power, power factor** Display.
2 Click "ENTER".

The **Power, Power factor** screen appears

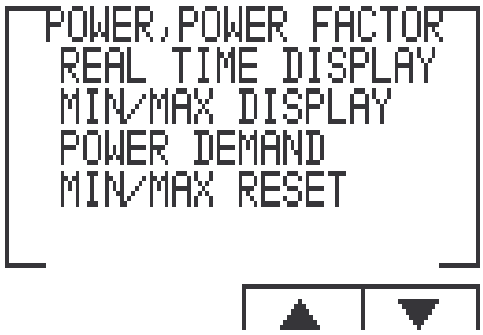

Figure 5.15 **Power, Power factor**

Scroll to **POWER DEMAND** and click "ENTER" in order to display power demand values.

The **Power Demand** screen appears

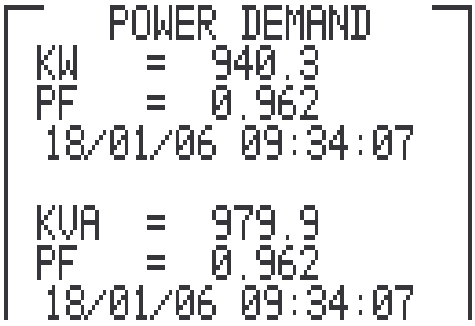

Figure 5.16 **Power Demand**

5.5 — Power Quality

NOTE!

Poor Harmonics could invoke a fine and damage to the electrical system and can be improved by adding filters.

The ***ElNet LT*** Energy & Power Multimeter *is* capable of displaying Harmonics in **Wave Form Graph, Harmonics Bar Graph,** for Voltage and Current.

5.5.1 — Wave Form Display

To display Wave Form Graphs

1 From Main Menu scroll to **Power** Quality.

2 Click “ENTER”.

The **Power Quality** screen appears

Figure 5.17 **Power Quality**

3 Scroll to **WAVE FORM** and **c**lick "ENTER".

The **Wave form Graphs** screen appears

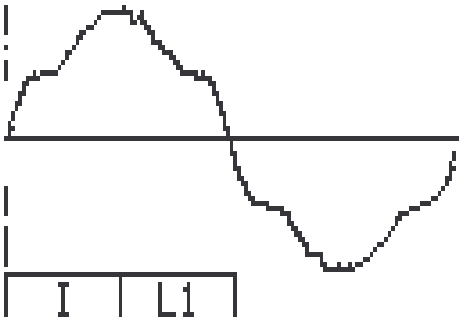

Figure 5.18 **Voltage Graph**

NOTE!

Available **Waveform Graphs**

1.	**Volts**	Line 1, Line 2 and Line 3
2.	**Current**	Line 1, Line 2 and Line 3

Use “F1” in order to display current waveform.
Use “F2” in order to toggle between L1, L2, L3.

5.5.2 — Harmonics Analyzer & THD

For analyzing and display Harmonics Bar Graphs & THD

1 From the Main Menu scroll to **Power Quality** Display.

2 Click “ENTER”.

The **Power Quality** screens appear - See Figure 5.18

3 Scroll to **Harmonics analyzer** and click “ENTER”.

The **Harmonics current Bar Graph** screens appear

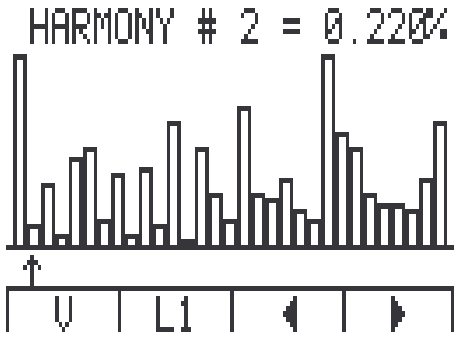

Figure 5.19 **Harmonics bar Graph**

Use “F1” (at least 2 seconds) in order to toggle the display between current waveform, voltage Waveform and THD (current & voltage Total Harmonic Distortion).

Use “F2” in order to toggle between L1, L2, L3.

Use “F3” “F4” in order to display and toggle between the harmonics values up to the 64th harmony.

NOTE!

The bar graph of the 1st Harmonics (100%) is shown without proportion to the other harmonics in order to display properly all the other harmonics.

5.5.3 — Alarm Setup

To set the alarm level for electrical measurements

1 From Main Menu scroll to Power Quality Display.

2 Click “ENTER”.

The **Power Quality** screens appear. – See Figure 5.18

3 Scroll to Alarm setup and click “ENTER”.
The **Alarm setup s**creens appear, and you will be requested to select the electrical measurement to be defined (voltage/ current / demand / KW IMP. / KW EXP) by pressing, “enter” and set the alarm levels.

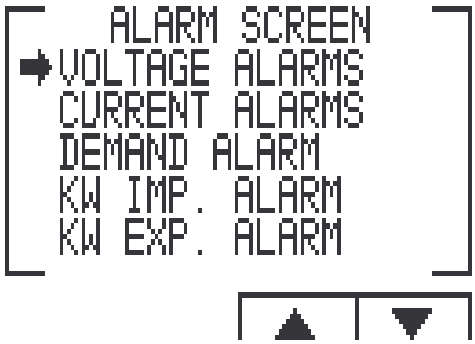

Figure 5.20 **Alarm Screen**

5.6 — Energy Metering

To display active reactive and Apparent Energy values

1 From Main Menu scroll to **ENERGY METER.**

2 Click "ENTER".

The **Energy Meter** screen appears

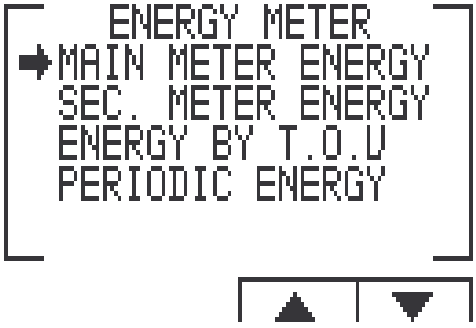

Figure 5.21 **Energy meter**

5.6.1 — Main Energy Meter

This meter will display the total energy that was measured and accumulated in the meter from the moment the meter was connected to the power. This meter is non erasable and the total energy that was measured and accumulated cannot be changed or deleted.

By using the sub menu you will be able to:

By using "F1" **The Elnet** will display the amount of the energy used for each rate:

RT1 = Rate number 1

RT2 = Rate number 2

RT3 = Rate number 3

ALL= All rates

By using "F2" **The Elnet** will display the amount of the energy used for each line:

L1 = Line number 1

L2 = Line number 2

L3 = Line number 3

ALL= All Lines

By using "F3" **The Elnet** will display the amount of the active, reactive and apparent energy:

P = only active energy

Q = only reactive energy

P = only Apparent energy

By using "F4" **The Elnet** will display the amount of the imported energy and the amount of the exported energy:

EXP = energy exported

IMP= energy imported

5.6.2 — 2nd. Energy meter

This meter will display the total energy that was measured and accumulated in the meter from the **last** "clear" of the accumulated energy data.

The accumulated energy data in this meter can be erasable ("cleared") by the user.

By using the sub menu you will be able to:

By using "F1" The **Elnet** will display the amount of the energy used for each rate:

RT1 = Rate number 1

RT2 = Rate number 2

RT3 = Rate number 3

ALL= All rates

By using "F2" The **Elnet** will display the amount of the energy used for each line:

L1 = Line number 1

L2 = Line number 2

L3 = Line number 3

ALL= All Lines

By using "F3" The **Elnet** will display the amount of the active, reactive and apparent energy:

P = only active energy

Q = only reactive energy

P = only Apparent energy

By pressing and holding the "F4" button for 6 seconds Elnet will delete the accumulated energy data:

CLR = Clear / Delete the accumulated energy data

5.6.3 — T.O.U Energy

The ***Elnet LT*** Energy & Power Multimeter record all energy values according to the T.O.U (time of use) schedule.

Each country has different T.O.U (time of use) schedule , in order to select the T.O.U schedule See Section 4.0 for instructions to arrive at the **Technical Menu**

1 From Technical Menu scroll twice to **NEXT**.
2 Scroll to **SELECT T.O.U RATES.**
3 Click "ENTER".

The **Select TOU rates** screen appears

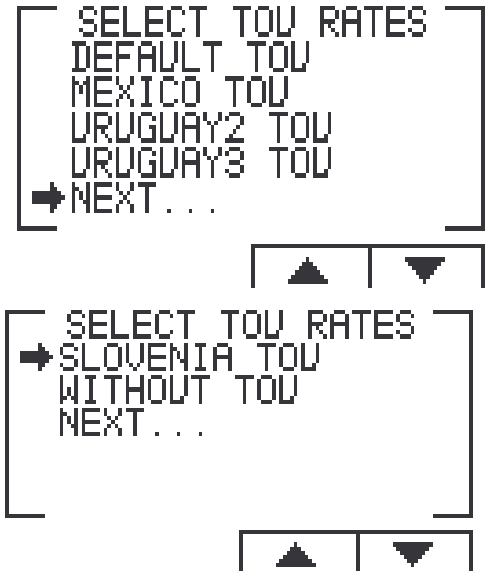

Figure 5.21 **Select TOU**

4 Select the T.O.U (time of use) schedule.

5.6.4 — Periodic Energy meter

This meter will display the total energy that was measured and accumulated between two dates which can be defined by the user.

By using the sub menu you will be able to:

By using “F1” (DATE) the user can define two dates in order to set the period of time for calculating the active energy in this period:

By Using “F2” The **Elnet** will display the amount of the active energy used for each rate:

RT1 = Rate number 1

RT2 = Rate number 2

RT3 = Rate number 3

ALL= All rates

By Using “F3” and “F4” The **Elnet** will display the amount of active energy, from the selected dates:

MON+ = Change the date by adding a month.

MON– = Change the date by subtracting a month.

CHAPTER 6 — COMMUNICATION

MODBUS Protocol

The ***Elnet LT*** Energy & Power Multimeter has a serial interface port allowing direct interface with an external communication network supporting the MODBUS Protocol.

MODBUS is an Industry Standard, widely known and commonly used communications protocol. Using MODBUS provides communication between a PC and up to 247 Powermeter slaves on a common line - the PC being the **master** and the powermeters the **slaves.** The PC initiates the transaction (either a query or broadcast) and the Powermeter/s responds. Powermeters respond to the **master** PC's request, but will not initiate any transmission on its own. The PC sends a single Query transaction and the Powermeter responds in a single response frame and is capable of only one query and one response at a time.

6.1 — MODBUS Framing

6.1.1— RTU Transmission Mode

MODBUS uses the standard Remote Terminal Unit (RTU) transmission mode. RTU mode sends data in 8-bit binary EVEN parity or 8-bit binary NO parity data format. For the ***Elnet LT*** Energy & Power Multimeter to successfully communicate, choose one in the communication Set Up.

Field	No. of bits
Start bit	1
Data bits	8
Parity	1
Stop it	1

Table 6.1 **RTU Data Format**

6.1.2 — The RTU Frame Format

Query and response information is sent in frames. Each frame contains:

Address

Function (See Section 6.1.4 for descriptions of functions),

Data

Check

Address	Function	Data	Check
8 bits	8 bits	N * 8 bits	16 bits

Table 6.2 **R T U Message Frame Format**

If the receiving device (Powermeter) detects a time laps of five characters, then it will assume the message is incomplete and will flush the frame. The device then assumes that the next byte received will be an address. The maximum query and response message length is 256 bytes includuing check characters.

6.1.3 — Address Field

Each Powermeter is designated in a network system by a user assigned address. The Address can be any number between 1 and 247. The Powermeter will only respond to its own specifically assigned address.

6.1.4 — Function Field

The function field contains the code that tells the Powermeter what action to perform.

The ***ElNet LT*** Energy & Power Multimeter uses and responds to four standard Message Format Functions.

Function 03

Function 04

Function 06

Function 16

Function	Meaning in MODBUS	Action
Function 03	Read holding register	Obtain data from Powermeter (Read register)
Function 04	Read input register	Obtain data from Powermeter (Read register)
Function 06	Preset single register	Transmit data to Powermeter (Write single register)
Function 16	Preset multiple register	Transmit data to Powermeter (Write multiple register)

Table 6.3 **Function Codes**

6.1.5 — Data Field

The Data field contains the body of the message and contains instructions from the PC **master** to the Powermeter **slave** to perform a particular action or respond to a query. The reply message from the Powermeter will be information contained in one or more of its registers.

6.1.6 — Check Field

The error check field contains the result of Cyclical Redundancy Check (CRC). The start of the message is ignored in calculating the CRC.

For more detailed information on CRC, refer to the MODBUS Protocol Reference Guide.

6.2 — Registers for ElNet LT Multimeter

The ***ElNet LT*** Energy & Power Multimeter is capable of supporting either Function 03 or Function 04 Message Format (see Table 6-3). In a reply to a query from the PC **master** for a reading from a particular field, the response from the Powermeter can be either in Format 03 or Format 04 but will depend on which Format the query was originally sent.

The difference is significant because by using Function 03 the ElNet LT will only send the INTERGER part of the field value requested and the PC **master** will only display the INTERGER part of the field value.

Function 04, on the other hand, is capable of sending two separate halves of the full FLOAT requested information (each half contained in a separate register). Then it is the task of the PC **master** to merge the two halves into a full FLOAT reply (For more detailed information See IEEE Standard 754 Floating-Point).

E.G. 1 If the user's PC **master** supports Function 03, then the reply will contain the INTERGER part of the field only.

The PC **master** requests the Voltage from Line1, and the actual Voltage in that field is 230.5 Volts.

Function 03 will respond with the INTERGER only i.e. 230V.

E.G. 2 If the user PC **master** supports Function 04, then the reply will contain the information stored in the two registers asssigned to that field and will contain the full, accurate reply.

The PC master requests the Voltage from Line1, and the actual Voltage in that field is 230.5 Volts.

Function 04 will respond with a composite reply of both register 1 and 2 giving the full FLOAT value (in IEEE Format) from that field i.e. 230.5V.

6.2.1 — Registers addresess

The ***ElNet LT*** MODBUS registers addresses are updated all the time and can be downloaded from the following web site:

http://www.ddc.co.il/elnet-pdf/elnet_comm.pdf

The MODBUS registers addresses numbering order specify at the above mentioned web address set as a defaults but can be changed in order to be fit to the SCADA/HMI drivers.

In order to change the MODBUS registers addresses numbering order:

See Section 4.0 for instructions to arrive at the **Technical Menu**

1 Scroll to **NEXT**
2 Scroll to **PARAMETERS ORDER.**
3 Click “ENTER”

The **PARAMETERS ORDER** screen appears

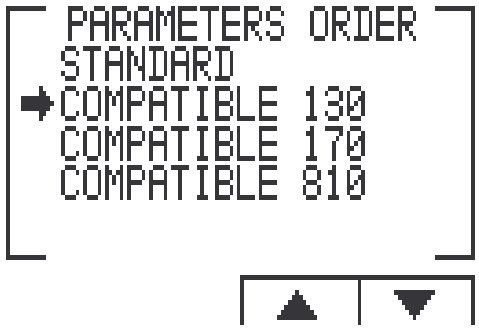

Figure 6.1 **Parameters Order**

Select the requested order that compatible to the driver installed in your SCADA/HMI

6.3 — Communication Connections

The ElNet LT Energy & Power Multimeter supports RS485 communication. Connections are provided on the Rear

Panel, (Please refer to section 2.3) and are made by means of the connectors provided.

6.4 — Communication Settings

To enable the ***User*** to connect the ***ElNet LT*** Energy & Power Multimeter to a PC computer for successful communications, the Communication Setup parameters of both must match; i.e. the port of the PC and the configuration settings of the Power meter.

Address
Baud Rate
Parity

6.4.1 — Communication Address

Each Power meter in a communication system must have its own unique address.

Because the ***ElNet LT*** Energy & Power Multimeter works on MODBUS, the available addresses are - from '1' to '247'

6.4.2 — Baud Rate

The Baud Rate is the communication speed in Bits per second (BPS) that the ***ElNet LT*** Energy & Power Multimeter communicates with the PC. The better the communication line Quality, the faster the communications may be.

If the communication line is routed through a "noisy" environment, it may be necessary to decrease the Baud Rate.

Available Baud Rates for the ***ElNet LT*** Multimeter:

600	bps
1200	bps
2400	bps
4800	bps
9600	bps
19200	bps

6.4.3 — Parity

The choices of parity are either NONE or EVEN (see Section 6.1.1 for description of Parity)

6.5 — Communication Set Up

6.5.1 — Set up Serial Communications

See Section 4.1 for instructions to reach the Technical Menu.

1 From Technical Menu scroll to Set Communication.

2 Click “ENTER”.

3 Scroll to "Serial Comm" and click "Enter".

The **Serial Communication Setup** screen appears

Figure 6.2 **Serial Communication Setup**

Use buttons F1 &F2, to set the values

Use the buttons F3 & F4 to move the cursor

NOTE!

When the selection is made it takes immediate affect with no further action required.

6.5.2 — Set up Ethernet Communications

See Section 4.1 for instructions to reach the Technical Menu.

1 From Technical Menu scroll to Set Communication.

2 Click “ENTER”.

3 Scroll to "Ethernet" and click "Enter".

The **Ethernet Communication Setup** screen appears

Figure 6.3 **Ethernet Communication Setup**

4 Scroll to "Set IP" and click "Enter".

The **IP Setup** screen appears

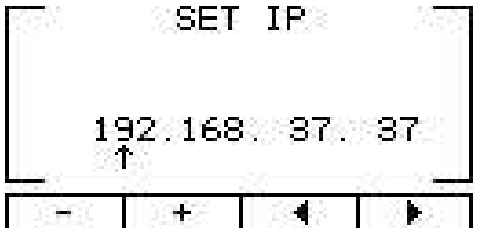

Figure 6.4 **IP Setup**

Use buttons F1 &F2, to set the values

Use the buttons F3 & F4 to move the cursor

5 If required: repeat steps 1-4 to set the GATEWAY and MASK.

6 The MAC address is set automatically however it can be changed as well by repeating steps 1-4.

6.6 — Communication with UniArt Software

CONTROL APPLICATIONS Ltd propriety software, "UniArt" is used to **Read** and **Write** Registers of the ***ElNet LT*** Energy & Power Multimeter. Each Item number in the Registers Table is a unique field containing information. The UniArt software manages each Item number as a parameter.
Refer to the UniArt manual how to set up parameters.

To read fields using UniArt

1 Find the reading required in the MODBUS Registers Table

2 Note the Item Number from the Registers Table

3 Go to the correct File number

Since File capacity in UniArt is limited to 128 parameters, the information contained in the ElNet LT fields is stored in several files.

File number is determined by the Item number

File # 0 contains	Item number	1 - 128
File # 1 contains	Item number	129 – 256
File # 2 contains	Item number	257 – 384
File # 3 contains	Item number	385 – 512

4 Go to the correct Point number within that file

Point number is determined by the formula:

Item number – [FILE X 128] = Point Number

E.G. 1 If the user the wishes to read Voltage Line 2 (Item No 2)
By applying the formula: 2 - [0 X 128] = 2
File = 0 and Point within that file = 2

E.G. 2 If the user the wishes to read 30th Harmonics for Volts Line1 (Item No 330)
By applying the formula: 330 - [2 X 128] = 74
File = 2 and Point within that file = 74

E.G. 3 If the user the wishes to read 7th Harmonic for Current Line 3 (Item No 467)

By applying the formula: 467 - [3 X 128] = 83
File = 3 and Point number within that file = 83

More Examples

E.G. No	Item No	Field Description	File	Point
1	2	Voltage Line 2	0	2
2	330	30th Harmonics for Volts Line1	2	74
3	467	7th Harmonic for Current Line 3	3	83
4	128		0	128
5	129		1	1
6	256		1	128
7	257		2	1
8	384	20th Harmonics for Volts Line 3	2	128
9	385	21st Harmonics for Volts Line3	3	1

Table 6.4 **Function Codes**

CHAPTER 7 — Specifications

Item	Description
Power requirements	85-260V AC or 110-300V DC ,60/50 Hz, 5VA
Dimensions	(HxWxD) 1106x300x60 mm
Shipping Weight	1,250 gr.
Measuring voltage limits	700VAC
Measuring current limits	6 A
Operating Voltage limits	1000 V
Operating Current limits	50 A
Enclosure material	ABS + Anti flame
Display	Graphic 64x128
Operating temperature	-20 - + 70 C
Storage temperature	-20 - + 80 C
Humidity	0- 90 RH%
Voltage input terminals	VL – E10 1708
Communication port	RS485
Mounting	Front Panel Mounting

Table 7.1 **Specifications**

All technical specifications are subject to change without notice.

Index

Appendix A — Installation & Configuration Check List

INSTALLATION CHECK LIST

Description	Date	Signature
Check contents of packaging		
Remove from packaging		
Prepare hole		
Mount Multimeter		
Connect Multimeter power supply		
Connect 3 Current Transformers		
Connect 3 Voltage lines		
Connect Neutral line		
Set Current Transformer Ratio		
Connect Communication lines		
Check Phase Order Connections		
Set Time and Date		

Appendix A Table - Installation & Configuration Check List